Alkylamines as Products of the Kjeldahl Digestion," by C. C. Erdmann. A method for the qualitative detection and approximate quantitative estimation of alkylamines in the presence of ammonia. Alkylamines were obtained from the product of the Kjeldahl digestion of methyl urea, creatin, creatinin and lecithin. "On the Alleged Occurrence of Trimethylamine in Urine," by C. C. Erdmann. Fresh, normal urine does not contain trimethylamine. "The Study of Autolysis by Physico-chemical Methods, II.," by Robert L. Benson and H. Gideon Wells. A discussion, with experimental data, of the value of estimations of freezing point and electrical conductivity in the study of autolysis. "A Method for Treating and Preserving Large Quantities of Urine for Inorganic Analysis," by Edgar F. Slagle. Add sulphuric acid and evaporate to dryness. "Phosphorus in Beef Animals, Part II.," by C. K. Francis and P. F. Trowbridge. Analytical data showing percentages of water, fat and phosphorus in various parts of cattle. "Note on Chemical Tests for Blood," by P. A. Kober, W. G. Lyle and J. T. Marshall. Tannic acid interferes with various common reactions for blood, hence water, not tea, should be given in test meals when the presence of blood is suspected.

A NEW PRINCIPLE IN THE MECHANISM OF NUCLEAR DIVISION

THE present conception of the causes, which determine the movements of the chromosomes and achromatic constituents of the nuclei of vegetable cells, can hardly be said to be in accordance with our views concerning the mechanical causes of other movements of plants.

It assumes contractility of protoplasmatic parts and affinity between homologous organs as the chief forces in play, but this assumption is evidently not sufficiently supported by what we know about contractility and organic affinity in other domains of physiology.

In a recently published paper, prepared in the laboratory of Strassburger, in Bonn, Mr. Theo. J. Stomps proposes a new principle for the explanation of the mechanism in question.[1] It is based on our knowledge of the function of osmotic forces in the growth of cells and in the movements of plant-organs and simply assumes the same forces for the process of nuclear division.

About forty years ago Sachs discovered the now universally acknowledged fact that growth and related movements, such as geotropism and heliotropism, are determined by the distending of the cell walls through the osmotic activity of the cell sap. The tension of tissues in growing parts was found to be due to the same cause, as were the reactions of sensible stamens to the stings of insects and of the motile organs of leaves to the changes in the intensity of the light.

At that time the presence of vacuoles with cell sap in very young cells, during their meristematic condition, was still unknown. This important fact was since discovered by Went, who proved the individuality and continuity of these vacuoles in the same way as this had been done for chloroplasts by Schmitz and Schimper. The foamy condition, which is now found to be so general in the protoplasm surrounding nuclei during their division, is due to the presence of numerous small vacuoles filled with cell sap. The walls of these vacuoles are to be considered as living parts of the protoplasm and as active in the secretion and accumulation of those substances which determine the osmotic pressure of the cells. These vacuoles may divide themselves or unite in groups into larger ones in the same way as these changes have so frequently been observed in older cells.

Starting from observations on the behavior of the chromosomes during the nuclear divisions in *Spinacia oleracea* and other plants, and especially from their visible changes during the synapsis and the reduction-divisions which prepare the production of the sexual cells, Mr. Stomps proposes a new principle for the mechanical explanation of these phenomena in general.

[1] Theo. J. Stomps, "Kerndeeling en Synapsis by *Spinacia oleracea* L.," Amsterdam, 1910.

He assumes that here also vacuoles are at work, and by their extension and subsequent collapsing produce all the movements which constitute the whole process of nuclear division, including the transportation of the chromosomes from the equatorial plane to the poles of the spindle and their subsequent assuming of the reticular condition in the resting nuclei.

In describing his observations as shortly as possible, we may start from the transportation just named. Fischer assumes movements of the granular plasm to account for this phenomenon, whilst most cytologists invoke a contraction of the threads of the spindle. But in *Spinacia* a longitudinal row of vacuoles is seen between the two separating halves of the chromosomes. Moreover, the spindle becomes larger during this process, and not smaller, as it should on the ground of the latter supposition. Often the chromosomes separate first at their free ends, instead of diverging first at the points where they are united to the threads of the spindle. This indicates the swelling of the vacuoles between them as the mechanical cause of their separation.

After reaching the poles of the spindle, the chromosomes at first constitute a compact group, but this is soon distended. Vacuoles are swelling between them; their walls are seen in the shape of fine lines of linin, giving the image of threads stretching from one chromosome to another. The swelling of these vacuoles is then seen to continue, they increase in volume, come forth from amidst the chromosomes and finally surround them on all sides, until their walls touch one another. In this way a complex group is produced, the outer walls of which combine to constitute the nuclear membrane, whilst the inner parts of the walls either disappear or otherwise become invisible.

The chromosomes now change from the compact into the reticular condition. They do so by means of numerous very small vacuoles, which slowly increase in size, and thereby distend the surrounding material. Each of the chromosomes is changed in this way into a network and the whole nucleus becomes a "*réseau de réseaux*" as it has been called by Grégoire.

When at the close of the reticular or resting period the nuclei return to activity, all these processes are, of course, gone through in the opposite direction. First the chromosome-vacuoles collapse, thereby restoring the compact condition. Then a longitudinal row of vacuoles appears in each chromosome, indicating the beginning of their division. Afterwards the nuclear vacuoles collapse, causing the nuclear membrane to disappear.

Even as in the petals of some colored flowers colored and uncolored vacuoles may be seen within the same cells, betraying different physiological properties of the individual vacuoles, Mr. Stomps assumes different qualities for his three main groups of vacuoles, viz., chromosome-nuclear and spindle-vacuoles.

The point in his description which will probably interest his readers most of all is the explanation of the nuclear membrane as a wall of numerous vacuoles, or a compound tonoplast.

In comparing the drawings and descriptions of Strasburger and others and especially those of Grégoire, with this new principle, it will easily be seen that in the main they quite well agree with it. The description of the nuclear division in the roots of *Allium* by Grégoire[2] may even be considered as good corroborative evidence. On the other hand, it is always hazardous to base a physiological hypothesis on the observation of fixed and stained material only. Experiments on the behavior of the new nuclear vacuoles during active life seem strongly required for a fully reliable proof.

HUGO DE VRIES

SPECIAL ARTICLES

UNISEXUAL BROODS OF DROSOPHILA

IN an experiment begun at Columbia University in March, 1909, several pairs of pomace flies produced broods consisting of males only, or females only. The sexes of *Drosophila* usually appear in very nearly equal numbers. Table I., A and B, gives the figures

[2] *La Cellule*, T. XXIII., Fasc. 2, 1906.